

**DESIGN AND CONSTRUCTION OF REVIEWING STANDS,
GRANDSTANDS AND BLEACHERS****IR 16-5**

Reference: 2001 California Building Code, Sections 1021, 1611A.12

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This Interpretation of Regulations (IR) is intended for use by the Division of the State Architect (DSA) staff, and as a resource for design professionals, to promote more uniform statewide criteria for plan review and construction inspection of projects within the jurisdiction of DSA, which include State of California public elementary and secondary schools (grades K-12), community colleges, and state-owned or state-leased essential services buildings. This IR indicates an acceptable method for achieving compliance with applicable codes and regulations, although other methods proposed by design professionals may be considered by DSA.

This IR is reviewed on a regular basis and is subject to revision at any time. Please check the DSA web site for currently effective IR's. Only IR's listed in the document at <http://www.dsa.dgs.ca.gov/Pubs/default.htm> (click on "DSA Interpretation of Regulations Manual") at the time of plan submittal to DSA are considered applicable.

Purpose: The purpose of this Interpretation of Regulations (IR) is to provide provisions solely for the design of bleachers with an overall height of 20 feet or less, and in no instance should be considered as a precedent for, or be used in the design of other types of structures. This IR is applicable for projects submitted to DSA under the 2001 CBC.

1. Definitions:

- 1.1** Reviewing stands, grandstands and bleachers more than five rows of seats above grade are considered "school buildings" (2001 CBC, Section 4-314) and are subject to DSA approval.
- 1.2** Bleachers which remain at a location for less than 90 days are excluded from DSA approval.
- 1.3** Portable bleachers refer to seating facilities located outside of a building and not attached to permanent foundations. The maximum height of any portable bleachers may not exceed eleven rows, or nine feet above grade to the top seating board.
- 1.4** Folding and telescoping seating facilities are structures used for tiered seating whose overall size and shape may be reduced without being dismantled for purposes of moving or storing.

2. Footings: Footings for outdoor seating facilities are required to comply with 2001 CBC, Section 1806A.10.

3. Relocation: DSA approval is only for the specific location originally shown. Any subsequent move to another location voids the approval and will require submittal of an application for approval at the new site.

4. Steel Design: (l = unsupported length of member).

4.1 Slender Columns: Columns having a slenderness ratio (l/r) from 200 to 300 may be used with the following restrictions.

4.1.1 Maximum Allowable Axial Load: The maximum permitted axial load is 2,000 lbs.

4.1.2 Allowable Stresses: The column will be checked for combined axial plus bending stress using the formula:

$$\frac{f_a}{F_a} + \frac{f_b}{0.6F_y} < 1.0$$

For a vertical column the additional bending will be computed by assuming a 20 lbs. concentrated horizontal load applied half-way between lateral supports (so as to produce maximum moment). For inclined or horizontal struts the additional bending will be computed for a 20 lbs. concentrated horizontal load or 150 lbs. concentrated vertical load applied at mid-span, whichever gives the larger bending stress. The allowable column stress will be determined from the formula:

$$F_a = \frac{\pi^2 E}{(l/r)^2} \left(\frac{35}{l/r - 125} \right)$$

This formula is indicated graphically in Figure 1 on page 5 of this IR.

4.1.3 Lateral Stays for Columns: Columns should be stayed laterally by direct connected compression struts in two directions at the points of lateral support.

4.2 Effective Lengths of Compression Members in X-Braces: Where a compression member is stayed by a tension member in the same plane, the length of the compression member will be limited to a maximum l/r of 200 based on the distance between the tension support and the end connection.

5. Tests on Steel: DSA will require steel tests in accordance with 2001 CBC, Section 2231A, subject to the following modifications:

5.1 Small Shapes and Bars: Shapes less than 1 square inch in cross section and bars other than flats less than 1/2 " thickness or diameter will not require the tension test, but will require a bend test.

5.2 Steel Tubing: Steel tubing used in bleachers is required to be made from new billets. Each size of tubing used on any project will be tested and required to conform to the following properties:

- Minimum yield point: 35,000 psi
- Minimum ultimate tensile strength: 60,000 psi
- Elongation 15% minimum in two inch gage length

6. Qualification of Welders and Inspection of Welding: Either of the following methods, items 6.1 or 6.2, may be used to satisfy the requirements of 2001 CBC, Section 2231A.

EXCEPTION: This provision need not apply to tack welds that were not later incorporated into finished welds carrying calculated stress.

6.1 Verified Reports: With each bleacher, the manufacturer will send DSA a verified report made by a qualified professional engineer, stating the following:

"Welds on this bleacher have been made by operators who have been previously qualified by tests, as prescribed in the Qualification Section of the Structural Welding Code of the American Welding Society, to perform the type of work required. I have selected a person qualified to act as welding inspector. I certify him to be experienced in inspection of arc welds on work requiring unquestioned reliability, and that he has the ability to distinguish between sound and unsound welding."

With each bleacher, the welding inspector will send DSA a verified report stating: "I have checked the equipment and find it adequate and have checked the ability of the welders and found them satisfactory. I have inspected all the welding and find it proper and in conformity with the plans and specifications and 2001 CBC, Chapter 22A. I have used all necessary tests to assure myself of the adequacy of the welding."

- 6.2 Local Welding Inspection:** A local qualified welding inspector, approved by DSA, will inspect the welding after delivery in California, and will submit a verified report stating:

"I have inspected all the welding and find it proper and in conformity with the plans and specifications and 2001 CBC, Chapter 22A. I have used all necessary tests to assure myself of the adequacy of the welding."

The manufacturer will pay the cost of inspection and necessary removal and retouching of paint.

- 7. Lumber:** Any one of the following three methods may be used to satisfy the requirements.

- 7.1 Method I:** The bleacher manufacturer may send DSA a lumber inspection certification by an approved grading agency, and a notarized certificate, signed by an official of the bleacher manufacturing company, stating that the lumber used in the bleachers is the same as that covered by the lumber inspection certificate.

- 7.2 Method II:** The bleacher manufacturer may send DSA a notarized certificate, signed by the official of the bleacher manufacturing company, stating that the official has personally inspected the lumber prior to processing or painting, and that it was grade marked by an approved grading agency and is in accordance with the approved plans and specifications. He shall list the grades indicated by the grade marks and note the maximum slope of grain if it is specified to be more restrictive than the grading rules requirement.

- 7.3 Method III:** A qualified professional engineer may certify that the lumber used in the bleachers conforms to the grades and other requirements called for in the approved plans and specifications.

When lumber is fabricated by gluing, certification of quality control and inspection of glue joints by an approved inspection agency will be submitted with the above certifications. Note that all methods of glue fabrication of lumber must be previously approved by DSA and the certification must state that all conditions of the approval have been complied with.

- 8. Concrete:** The requirements governing the quality of concrete may be satisfied by one of the following: (Also see 2001 CBC, Section 1905A.)

- 8.1** A report of strength tests of two identical cylinders taken for each day's pour; one tested at the age of seven days and the other at 28 days. The report should indicate strengths equal to or exceeding the specified strength required for the project.

- 8.2** The above test report and affidavit are not required when the following provisions of bleacher pier footings are complied with and not listed on the structural test and inspection list.

- 8.2.1 Bleacher Pier Footings:** Concrete may be placed in bleacher pier footings without continuous inspection by the inspector of record providing the thickness of such footings is not less than one half (1/2) the width or length of the footings, whichever results in the greater thickness. Test cylinders will not be required for such concrete.

- 9. Other Materials:** Certification and testing of materials other than the proceeding should be in accordance with the appropriate sections of the CBC, and/or as determined by DSA.

9.1 General Affidavit Requirements: All verified reports and certificates will be filed in duplicate. They must be notarized or the original signature of the person making the report or certificate must be preceded by the statement:

"I certify (or declare) under penalty of perjury that I have read the above report and know of the contents thereof, and that all of the above statements are true."

10. Load Tests: When load tests are made as a basis for approval of bleachers by DSA, test loads will be applied in not less than four, approximately equal increments, without shock to the structure and in a manner to avoid arching of the loading materials or stiffening of the structure.

The load test procedure must be approved by DSA prior to testing. The strength of the material in the test bleacher should not exceed the minimum specified strength by more than 5 percent.

10.1 Test Load Factors: When load tests are made to check design or as a basis for approval of bleachers, the test load should be not less than twice the design vertical load combined with twice the design lateral load.

Attachment:

Figure 1

Figure 1
Allowable stresses in minor bleacher struts and columns ($200 \leq l/r \leq 300$)

